IN THE UNITED STATES
PATENT AND TRADEMARK OFFICE

Patent Application

Inventor: Kai H. Chang
David Kalish
Thomas J. Miller

Case: 6-17-28

Serial No.: 10/620,068 **Group Art Unit:** 1731

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Examiner: Hoffmann, John M

Title: Method And Apparatus For Fabricating Optical Fiber Using Deuterium Exposure

COMMISSIONER FOR PATENTS
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DECLARATION OF KAI H. CHANG UNDER 37 C.F.R. §1.131

Sir:

I, Kai H. Chang, state that:

1. I am over the age of twenty-one (21) years. I am not suffering from any disabilities, I am competent to make this Declaration, and have personal knowledge of the facts set forth herein.
2. I am a co-inventor of the subject matter disclosed, and claimed, in the above-referenced patent application. At the time of the invention, I was an employee of Lucent Technologies Inc. (Lucent).
3. The invention was conceived at least as early as May 31, 2000, the date on which I sent an electronic mail message to co-inventor David Kalish disclosing deuterium treatment at room temperature and asking whether he believed that it was patentable. A true and accurate copy of that

electronic mail message has already been sent to the Patent Office in a Declaration that I signed on June 22, 2005.

4. During the period from May 31, 2000, to June 26, 2001, the filing date of the parent application (Serial number 09/891,903, now U.S. Patent 6,776,012) of the above-referenced patent application, I diligently worked to develop the commercial embodiments of the invention that are disclosed and claimed in the patent application. Listed below are descriptions of electronic mail messages and other documents that are submitted herewith as evidence of this diligence. True and accurate copies of these electronic mail messages and documents also are submitted herewith as Exhibits 1-29.

5. Throughout Exhibits 1-29, reference is frequently made to "hydrogen aging," project "Jasper," and project "Ruby." These directly relate to deuterium treatment of optical fiber at room temperature as discussed below.

6. "Hydrogen aging" is a phenomenon whereby atomic defects in the silica structure of a glass fiber chemically react with hydrogen molecules and cause undesirable optical transmission loss, which frequently involves the 1400 nm wavelength region due to the formation of OH ions. A discussion of this phenomenon is contained within the patent specification in greater detail. "Hydrogen aging" loss is thwarted by exposing the optical fiber to deuterium at room temperature before the optical fiber has a chance to be exposed to hydrogen, which frequently exists in trace quantities in fiber installations. Fiber treated in deuterium will not react with hydrogen because the atomic defects in fiber are passivated by deuterium to form OD ions. Although OD ions also cause optical transmission loss, it occurs at wavelengths that do not interfere with normal optical transmission in telecommunication applications.

7. Projects "Jasper" and "Ruby" were internal names at Lucent for two joint ventures between Lucent and the Furukawa Electric Company (FEC) in the year 2000 time frame in which *AllWave*® optical fiber (frequently

abbreviated "AW" in the attached Exhibits) would be made and receive room temperature deuterium treatment. "Jasper" was a factory to be built in South Carolina, and "Ruby" was a factory to be built in China.

8. *AllWave* optical fiber has little or no loss at about 1400 nm that is attributable to absorption by OH ion impurities. Accordingly, eliminating the hydrogen aging loss in this wavelength region is particularly important for this fiber.

9. Our primary competitor in the optical fiber business in the year 2000 time frame was Corning Incorporated who, we believe, was unaware that room temperature deuterium treatment would effectively eliminate hydrogen aging in optical fibers. "Jasper" and "Ruby" were critical competitive measures to improve Lucent's market position, *vis á vis* Corning, in the sale of optical fiber (*i.e., AllWave* optical fiber) having low loss in the 1400 nm wavelength region.

9. Descriptions of Exhibits 1-28, copies of which are submitted herewith:

i) Exhibit 1 - June 6, 2000 - an electronic mail message from co-inventor Tom Miller to co-inventor Kai Chang and electronic reply from Kai Chang to Tom Miller, containing a general discussion of hydrogen aging losses and the use of deuterium in reducing hydrogen aging loss. The attachment to this electronic mail message specifically references deuterium treatment at room temperature.

ii) Exhibit 2 – June 13, 2000 – As a part of projects "Jasper" and "Ruby," I identified an important issue regarding the 25-year stability of SiOD in the presence of hydrogen and determined that experimental data was needed to resolve the issue.

iii) Exhibit 3 - June 23, 2000 - an electronic mail message from Tom Miller to Kai Chang, forwarding previous electronic mail messages, including a June 6, 2000 electronic mail message from Mike Ring that references room temperature testing for hydrogen aging for deuterium conditioned samples (see point 2 of the "brief summary of the meetings"

portion of the electronic mail message) as part of the joint development with FEC for projects "Jasper" and "Ruby."

iv) Exhibit 4 - June 30, 2000 - an electronic mail message from Kai Chang to Mr. Takahashi of FEC, including a discussion of hydrogen aging loss analysis for deuterium treated fibers and the stability of SiOD.

v) Exhibit 5 - July 6, 2000 - an electronic mail message from Kai Chang to Tom Miller, listing information exchanged during a meeting with FEC including point 3 on room temperature deuterium treatment of fibers.

vi) Exhibit 6 - August 28, 2000 - an electronic mail message from Kai Chang to Tom Miller, discussing whether Corning is using deuterium treatment, whether deuterium treatment should be kept as a trade secret, and earlier August emails regarding FEC's 1982 deuterium patent (deuterium treatment at elevated temperatures).

vii) Exhibit 7 - August 30, 2000 - an electronic mail message from Kai Chang to Tom Miller, including experimental results for project Ruby, which results are directed to reducing hydrogen aging loss.

viii) Exhibit 8 - September 6, 2000 - an electronic mail message from Kai Chang to co-inventor Dave Kalish discussing deuterium treatment at room temperature to reduce hydrogen aging losses (see item 3 in the electronic mail message).

ix) Exhibit 9 - September 8, 2000 - an electronic mail message from Tom Miller to Kai Chang, discussing experiments to reduce hydrogen loss using CF_4 and FEC's view of bypassing the deuterium treatment process.

x) Exhibit 10 - September 11, 2000 - an electronic mail message from Kai Chang to Dave Kalish, discussing the problem of hydrogen aging and the atomic defects formed in different manufacturing processes for synthetic silica..

xi) Exhibit 11 - September 21, 2000 - an electronic mail message from Kai Chang to Mikio Oda of FEC, mentioning hydrogen aging loss data for deuterium treated and untreated fibers.

xii) Exhibit 12 - October 3, 2000 - an electronic mail message from Kai Chang to Gary Epp of Lucent, discussing what information was discussed between Lucent and FEC during a project Ruby meeting, including hydrogen aging and deuterium treatment.

xiii) Exhibit 13 - October 4, 2000 - an electronic mail message from Kai Chang to Gary Epp, discussing an IEC/ITU standards bodies meeting on the standardization of a hydrogen-aging test and the advantage of our deuterium-treated fiber in such a test..

xiv) Exhibit 14 - October 19, 2000 - an electronic mail message from Kai Chang to Mikio Oda, including further discussions of hydrogen aging loss testing, including deuterium treated fiber.

xv) Exhibit 15 - November 27, 2000 - an electronic mail message from Kai Chang to Dave Kalish, discussing a meeting with Lucent patent attorney Mike Morra about what ultimately becomes the parent application of the applicants' invention. The electronic mail message includes an attachment that details hydrogen aging and includes solutions offered by the inventors.

xvi) Exhibit 16 - January 18, 2001 - an electronic mail message from Tom Miller to Kai Chang. The electronic mail message includes an attachment of the minutes of a meeting with FEC regarding project Jasper and the requirement for deuterium treatment of *AllWave* optical fiber production.

xvii) Exhibit 17 - January 18, 2001 - an electronic mail message from Kai Chang to Tom Miller, discussing how FEC's deuterium treatment differs from the inventors' deuterium treatment, which is low cost due to the use of low concentrations of deuterium.

xviii) Exhibit 18 - January 18, 2001 - an electronic mail message from Tom Miller to Mike Sowers, commenting about the summary of a meeting with FEC. The comments briefly mention deuterium treatment and how minimum deuterium treatment cycle time needed to be worked out with FEC.

xix) Exhibit 19 - January 25, 2001 - an electronic mail message from Kai Chang to Tom Miller, discussing a high-temperature deuterium treatment performed by the Lucent Specialty Fiber business unit. The discussion specifically differentiates our room–temperature deuterium treatment from high-temperature deuterium treatment used in specialty fiber.

xx) Exhibit 20 - January 26, 2001 - an invention disclosure form delivered to Lucent patent attorneys for drafting a patent application.

xxi) Exhibit 21 - January 26, 2001 - an electronic mail message from Kai Chang to Lucent patent attorney John Harman, commenting on filing patent applications for deuterium treatment.

xxii) Exhibit 22 - January 26, 2001 - an electronic mail message from Dave Kalish to Kai Chang, agreeing with Kai Chang about filing patent applications on deuterium treatment.

xxiii) Exhibit 23 - February 15, 2001 - an electronic mail message from Kai Chang to Dave Kalish, discussing deuterium treatment and specifically mentioning deuterium treatment at room temperature.

xxiv) Exhibit 24 - February 21, 2001 - an electronic mail message from Mikio Oda to Kai Chang, mentioning deuterium treatment and gas specification for projects "Jasper" and "Ruby."

xxv) Exhibit 25 - February 22, 2001 - an electronic mail message from Tom Miller to Mikio Oda, mentioning deuterium treatment.

xxvi) Exhibit 26 - March 7, 2001 - an electronic mail message from Tom Miller to Wesley Pidgeon, discussing hydrogen aging and mentioning possible deuterium treatment for *AllWave* optical fiber.

xxvii) Exhibit 27 - March 16, 2001 - an electronic mail message from Tom Miller to Kai Chang, including an attachment of a slide presentation on the planning for deuterium treatment for *AllWave* optical fiber. The slide presentation references a brainstorming session on March 15, 2001, and also mentions equipment requirements.

xxviii) Exhibit 28 - March 19, 2001 - an electronic mail message from Mike Mueller to Terry Tincher, discussing the deuterium treatment procedures and attaching sketches of possible equipment used for deuterium treatment.

xxix) Exhibit 29 - April 12, 2001 - an electronic mail message from John Harman to Kai Chang attaching a draft of the parent application (Appl. Serial No. 09/891,903, US Patent No. 6,776,012) of the applicants' invention.

I HEREBY DECLARE that all statements made herein of my own knowledge are true, and that all statements made on information and belief are believed to be true, and that these statements are made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that any such willful false statements may jeopardize the validity of the above-referenced patent application, or any patent issued thereon.

Kai H. Chang, Ph. D.

10/25/05

Date